Roll No											

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING
END TERM EXAMINATION - JUN 2023

Semester : Semester IV - 2021

Course Code : PET2004

Course Name : Sem IV - PET2004 - Fundamentals of Petroleum Reservoir Engineering

Program : PET

Date : 9-JUN-2023

Time : 9.30AM -12.30PM

Max Marks : 100

Weightage : 50%

Instructions:

(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.
(iv) Do not write any information on the question paper other than Roll Number.

PART A

ANSWER ALL THE QUESTIONS **(10 X 3 = 30M)**

1. Which is the most efficient and least efficient drive mechanism? Why?

(CO3) [Knowledge]

2. What is wettability? Why it is important for recovery of oil.

(CO1) [Knowledge]

3. Arrange the following in increasing order of compressibility factor. oil, water, rock, natural gas

(CO1) [Knowledge]

4. What is rock and fluid expansion drive? What is the driving force for this mechanism?

(CO2) [Knowledge]

5. Define dip angle. Why it is important for gravity segregation drive mechanism?

(CO3) [Knowledge]

6. List minimum three rock properties and two fluid properties.

(CO1) [Knowledge]

7. Differentiate between decline curve analysis and material balance equation.

(CO4) [Knowledge]

8. What is secondary and tertiary recovery mechanism? Write the main objective of secondary recovery mechanism.

(CO2) [Knowledge]

9. Define cappilary pressure and capillary number. Cappilary pressure should be ---------- for maximum production of oil.

(CO1) [Knowledge]

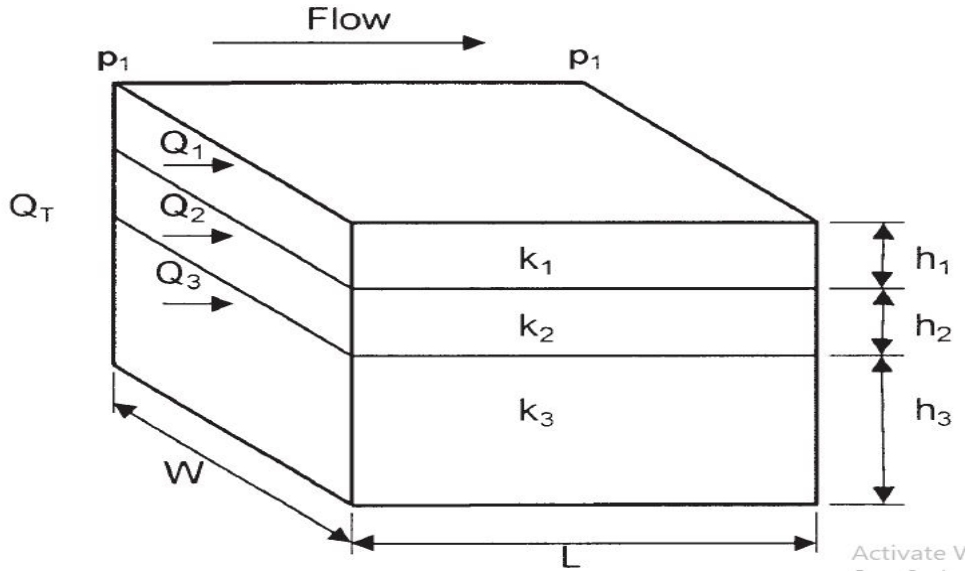
10. Differentiate between solution drive and gas cap drive mechanism.

(CO2) [Knowledge]

PART B

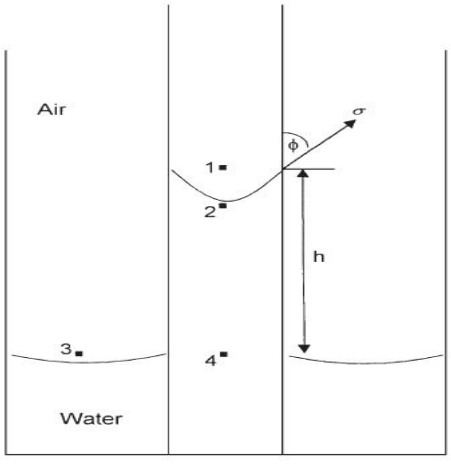
ANSWER ALL THE QUESTIONS **(2 X 15 = 30M)**

11. Weighted averaging method is used to determine the average permeability of linear layered-parallel beds with different permeabilities. Consider the case where the flow system is comprised of three parallel layers that are separated from one another by thin impermeable barriers, i.e., no cross flow, as shown in Figure. Formulate one mathematical relation to find the average permeability for the given reservoir.



(CO3) [Comprehension]

12. Surface tension is depend on radius of capillary tube, hight of capillary rise h, density of the liquid and contact angle between liquid and capillary tube. Establish a methematical relation for surface tension for the given figure where r is the radius of capillary, h is the hight of capillary rise, θ is the contact angle and ρw is the density of water.
Differentiate surface tension and interfacial tensuion.



(CO2) [Comprehension]

PART C

ANSWER ALL THE QUESTIONS **(2 X 20 = 40M)**

13. A combination-drive reservoir contains 10 MMSTB of oil initially in place. The ratio of the original gas-cap volume to the original oil volume, i.e., m, is estimated as 0.25. The initial reservoir pressure is 3000 psia at 150°F. The reservoir produced 1 MMSTB of oil, 1100 MMscf of 0.8 specific gravity gas, and 50,000 STB of water by the time the reservoir pressure dropped to 2800 psi. The following PVT is available:

Estimate the following:

a. Cumulative water influx

b. Net water influx

c. Primary driving indexes at 2800 psi

	3000 psi	2800 psi
B_o, bbl/STB	1.58	1.48
R_s, scf/STB	1040	850
B_g, bbl/scf	0.00080	0.00092
B_t, bbl/STB	1.58	1.655
B_w, bbl/STB	1.000	1.000

The following data are also available:

$S_{wi} = 0.20 \qquad c_w = 1.5 \times 10^{-6}\ \text{psi}^{-1} \qquad c_f = 1 \times 10^{-6}\ \text{psi}^{-1}$

(CO3) [Application]

14. An oil well is producing at a constant flow rate of 300 STB/day under unsteady-state flow conditions. The reservoir has the following rock and fluid properties:

Oil formation volume factor Bo = 1.25 bbl/STB, Viscosity μo = 1.5 cp,

Total compressibility ct = 12 × 10−6 psi−1, Permeability ko = 60 md,

Height of pay zone h = 15 ft, pi = 4000 psi, Porosityφ = 15%,

Wellbore radius rw = 0.25 ft

Calculate pressure at radii of 0.25, 5, 50, 100, 500, 1000, and 2500 feet, for 1 hour.

Plot the results as: Pressure versus radius

(CO2) [Application]